CLAIMS

What is claimed is:

1. A closure assembly comprising:

a closure member;

a window bracket coupled to said closure member, said window bracket including a channel for receiving said closure member therein; and

a pair of metal plates disposed on opposite sides of said window bracket and including a clamping mechanism engaging each of said pair of metal plates for drawing said metal plates toward one another.

2. The closure assembly of claim 1, wherein said pair of metal plates are generally concave and apply a clamping force to said window support member on opposite sides of said channel.

3. The closure assembly of claim 1, further comprising a support member coupled to said window bracket and adapted to be driven for the raising and lowering of said closure member; and

an interface between said window bracket and said support member permitting axial and pivotal movement of said closure member with respect to said support member.

4. The closure assembly of claim 3, wherein said interface includes a head portion slidably and rotatably received in a guide portion.

5. The closure assembly of claim 4, wherein said head portion is semi-cylindrical and said guide portion is semi-cylindrical.

6. The closure assembly of claim 1, wherein said window bracket includes recessed groove portions for receiving opposite edges of said pair of metal plates.

7. The closure assembly of claim 2, wherein said window bracket includes recessed groove portions for receiving opposite edges of said pair of metal plates.

8. The closure assembly of claim 1, wherein said clamping mechanism includes a threaded screw extending through each of said metal plates.

9. A closure assembly comprising:

a closure member;

a window bracket coupled to said closure member, said window bracket including a channel for receiving said closure member therein; and

a wedge mechanism received in said channel for securing said closure member in said channel.

10. The closure assembly of claim 9, wherein said wedge mechanism is spring biased into said channel.

11. The closure assembly of claim 9, wherein said channel includes at least one inwardly angled sidewall.

12. The closure assembly of claim 9, wherein said wedge mechanism includes an elastomeric wedge member pivotally supported by an over-center toggle spring mechanism pivotally mounted to said window bracket.

13. The closure assembly of claim 9, further comprising a support member coupled to said window bracket and adapted to be driven for the raising and lowering of said closure member; and

an interface between said window bracket and said support member permitting axial and pivotal movement of said closure member with respect to said support member.

14. The closure assembly of claim 13, wherein said interface includes a head portion slidably and rotatably received in a guide portion.

15. The closure assembly of claim 14, wherein said head portion is semi-cylindrical and said guide portion is semi-cylindrical.

16. A method for assembling a window lift mechanism, comprising the steps of:

mounting a motor housing assembly to a main bracket, said motor housing assembly including a motor drivingly connected to a worm and worm gear, said worm gear including a shaft rotatably connected to said worm gear and extending through said main bracket;

mounting a first pinion gear onto said shaft and mounting a second pinion gear in meshing engagement with said first pinion gear;

placing a dual rack system in alignment with said pinion gears; and

applying power to the motor to drive said pinion gears to engage said pinion gears with said dual rack system.

17. The method of claim 16, wherein said step of applying power to the motor further includes driving the first and second pinion gears to move the main bracket and motor to a predetermined position for convenient door installation.

18. The method of claim 16, wherein said step of placing a dual rack system in alignment with said pinion gears includes placing the dual rack assembly in a guide system of said main bracket.

19. A dual rack assembly, comprising:

a base frame structure adapted to be mounted to a vehicle door; and

a pair of rack members each including a plurality of gear teeth extending along said rack members, said rack members being snap fit to said base frame structure.

20. An integrally formed dual rack system, comprising:

a pair of elongated parallel racks each including a plurality of gear teeth extending therealong; and

a cross brace structure extending between said pair of elongated parallel racks and integrally molded as a unitary piece with said pair of elongated racks.

21. A window lift mechanism comprising:

a dual rack system;

a support structure supported on said dual rack system;

a drive pinion gear supported by said support structure and in engagement with a rack of said dual rack system;

a slave pinion gear supported by said support structure, said slave pinion gear including a first gear segment in engagement with said drive pinion

gear and a second gear segment in engagement with a second rack of said dual rack system, said first and second gear segments including a resilient shock absorber operatively engaged therebetween;

a worm gear supported for rotation by said support structure and operatively joined with said drive pinion gear; and

a motor supported by said support structure and including an output shaft having a worm engaged with said worm gear.

22. The window lift mechanism according to claim 21, further comprising at least one resilient shock absorber operatively engaged between said drive pinion gear and said worm gear.

23. The window life mechanism according to claim 21, further comprising a pair of resilient shock absorbers operatively engaged between said drive pinion gear and said worm gear.

24. The window lift mechanism according to claim 21, wherein said motor is a smart motor system capable of detecting obstructions and reversing operation thereof in response to a detected obstruction.

25. A window lift mechanism comprising:

a dual rack system;

a support structure supported on said dual rack system;

a gear train including:

a drive pinion gear supported by said support structure and in engagement with a rack of said dual rack system;

a slave pinion gear supported by said support structure in engagement with said drive pinion gear and a second rack of said dual rack system;

a worm gear supported for rotation by said support structure and operatively joined with said drive pinion gear, said gear train including a plurality of resilient shock absorbers disposed therein; and

a motor supported by said support structure and including an output shaft having a worm engaged with said worm gear.

26. A window lift mechanism comprising:

a support structure;

a pinion gear supported by said support structure;

a worm gear supported for rotation by said support structure and operatively joined with said pinion gear;

a motor supported by said support structure and including an output shaft having a worm engaged with said worm gear; and

a resilient shock absorber operatively engaged between said pinion gear and said worm gear, said resilient shock absorber includes a body portion having a central opening therethrough and a plurality of cutouts extending radially inward from an outer surface thereof and a plurality of cutouts extending radially outwardly from an inner surface thereof said plurality of cutouts define a plurality of body segments therebetween, said plurality of body segments having an outer perimeter surface with radially inwardly notched portions to allow for deformation of said resilient shock absorber.

27. The window lift mechanism of claim 26 wherein said resilient shock absorber is made of elastomeric material.

28. The window lift mechanism of claim 26 wherein a shock absorber chamber is disposed between said worm gear and said pinion gear for the receipt of said resilient shock absorber.

29. The window lift mechanism of claim 26 wherein said pinion gear has a plurality of raised surfaces for retaining said resilient shock absorber.

30. The window lift mechanism of claim 26 further comprising an intermediate member drivingly engaged with said worm gear and said resilient shock absorber.

31. The window lift mechanism of claim 30 wherein said intermediate member has two interface sides, one of said interface sides has protrusions which connect to said worm gear, and the other of said interface sides has a plurality of raised surfaces to receive said resilient shock absorber.

32. The window lift mechanism of claim 26 wherein said pinion gear defines an interior chamber for receiving said resilient shock absorber therein.

33. The window lift mechanism of claim 26, further comprising a clutch mechanism disposed between said worm gear and said pinion gear.

34. A window lift mechanism comprising:

a support structure;

a pinion gear supported by said support structure;

a first worm gear supported for rotation by said support structure and drivingly engaged with said pinion gear;

a motor supported by said closure member and including an output shaft;

a worm connected to said output shaft of said motor and engaged with said worm gear, said worm having a lead angle greater than seven degrees; and

a clutch mechanism disposed between said worm gear and said pinion gear to prevent back-drive.

35. The window lift mechanism of claim 34 wherein said clutch mechanism further includes at least one coil spring.

36. The window lift mechanism of claim 34 wherein said worm gear includes a first shaft portion which engages said clutch mechanism and said pinion gear includes a second shaft portion which engages said clutch mechanism.

37. The window lift mechanism of claim 36, wherein said second shaft portion is defined by an intermediate member drivingly attached to said pinion gear.

38. A window lift mechanism comprising:

a support structure;

a pinion gear supported by said support structure;

a worm gear supported for rotation by said support structure meshingly engaged with said pinion gear;

a motor supported by said support structure and including an output shaft;

a worm connected to said output shaft and engaged with said worm gear; and

a clutch mechanism disposed between said worm gear and said pinion gear.

39. The window lift mechanism of claim 38 wherein said worm has a lead angle greater than seven degrees.

40. A closure assembly comprising:

a closure member;

a first support coupled to said closure member;

a second support coupled to said first support and adapted to be driven for the raising and lowering of said closure member; and

an interface between said first and second supports adapted to accommodate both axial and pivotal movement of said closure member with respect to said second support.

41. The closure member of claim 40 wherein said first support has a slotted end for receiving said closure member and a semi-cylindrical recess for receiving a semi-cylindrical head of said second support.

42. The closure member of claim 40, wherein said interface includes a head portion slidably and rotatably received in a channel portion.

43. The closure member of claim 42, wherein said head portion is semi-cylindrical and said channel portion is semi-cylindrical.

44. A closure assembly comprising:

a closure member;

a first support coupled to said closure member;

a second support coupled to said first support and adapted to be driven for the raising and lowering of said closure member; and

said first support having a slot in which said closure member is received and an interface between said first and second supports, wherein said interface is adapted to accommodate both axial and rotational movement of said first support with respect to said second support.

45. A bracket for a window lift mechanism, comprising:

a crossbar and transmission housing formed as a single unit, said crossbar and transmission housing including a motor mounting structure, a

passage for receiving a drive shaft, a gear cavity, at least one rack guide feature and a slave gear hub portion all formed as a unitary piece.

46. The bracket according to claim 45, wherein said gear cavity includes a gear hub portion disposed therein.

47. The bracket according to claim 45, further comprising a pair of window bracket mounting features.

48. A bracket for a window lift mechanism, comprising:

a crossbar and transmission housing formed as a single unit, said crossbar and transmission housing including a passage for receiving a drive shaft, a gear cavity, at least one rack guide feature and a slave gear hub portion all formed as a unitary piece.

49. A bracket for a window lift mechanism, comprising:

a crossbar and transmission housing formed as a single unit, said crossbar and transmission housing including a motor mounting structure, a passage for receiving a drive shaft, at least one rack guide feature and a slave gear hub portion all formed as a unitary piece.

50. A bracket for a window lift mechanism, comprising:

a crossbar and transmission housing formed as a single unit, said crossbar and transmission housing including a motor mounting structure, a passage for receiving a drive shaft, a gear cavity and a slave gear hub portion all formed as a unitary piece.

51. A bracket for a window lift mechanism, comprising:

a crossbar and transmission housing formed as a single unit, said crossbar and transmission housing including a motor mounting structure, a passage for receiving a drive shaft, a gear cavity and at least one rack guide feature all formed as a unitary piece.

52. A bracket for a window lift mechanism, comprising:

a crossbar and transmission housing formed as a single unit, said crossbar and transmission housing including a motor mounting structure, a gear cavity, at least one rack guide feature and a slave gear hub portion all formed as a unitary piece.

53. A window lift mechanism, comprising:

a crossbar and transmission housing formed as a single unit, said crossbar and transmission housing including a motor mounting structure, a passage for receiving a drive shaft, at least one rack guide feature and a slave gear hub portion all formed as a unitary piece;

a motor mounted to said motor mounting structure, said motor including a drive shaft received in said passage;

a first pinion gear received operably driven by said motor;

a second pinion gear rotatably mounted to said slave gear hub and drivingly engaged with said first pinion gear; and

a dual rack system having parallel toothed racks spaced from one another and each engaging a respective one of said first and second pinion gears, said dual rack system being engaged by said at least one rack guide feature.

54. The window lift mechanism according to claim 53, wherein said crossbar and transmission housing includes a gear cavity, and further comprising a worm gear disposed in said gear cavity and drivably engaged with a worm mounted to said drive shaft, said worm gear being drivably engaged with said first pinion gear.

55. A window lift mechanism, comprising:

a crossbar and transmission housing formed as a single unit, said crossbar and transmission housing including a motor mounting structure, a passage for receiving a drive shaft, at least one rack guide feature and a gear cavity all formed as a unitary piece;

a motor mounted to said motor mounting structure, said motor including a drive shaft received in said passage;

a first pinion gear received operably driven by said motor;

a second pinion gear rotatably mounted to said crossbar and transmission housing; and

a dual rack system having parallel toothed racks spaced from one another and each engaging a respective one of said first and second pinion

gears, said dual rack system being engaged by said at least one rack guide feature.

56. A method for assembling a window lift mechanism, comprising the steps of:

mounting a motor to a motor mounting feature of a crossbar and transmission housing, said crossbar and transmission housing including said motor mounting feature, a gear cavity, a passage for receiving a drive shaft, at least one rack guide feature and a slave gear hub portion all formed as a unitary piece;

said motor drivingly connected to a worm;

mounting a worm gear in said gear cavity;

mounting a first pinion gear in driving engagement with said worm gear and mounting a second pinion gear on said slave gear hub portion and in meshing engagement with said first pinion gear;

placing a dual rack system in alignment with said pinion gears; and

applying power to the motor to drive said pinion gears to engage said first and second pinion gears and said at least one rack guide feature with said dual rack system.

57. A method for assembling a window lift mechanism, comprising the steps of:

mounting a motor to a motor mounting feature of a crossbar and transmission housing, said crossbar and transmission housing including said motor mounting feature, a gear cavity, a passage for receiving a drive shaft and at least one rack guide feature all formed as a unitary piece;

said motor drivingly connected to a worm;

mounting a worm gear in said gear cavity in meshing engagement with said worm;

mounting a first pinion gear in driving engagement with said worm gear and mounting a second pinion gear on said crossbar and transmission housing;

placing a dual rack system in alignment with said pinion gears; and

applying power to the motor to drive said pinion gears to engage said first and second pinion gears and said at least one rack guide feature with said dual rack system.

58. A vehicle door comprising:

an outer door panel;

an inner door panel connected to said outer door panel;

a window lift mechanism disposed between said inner and outer door panels and including a pair of spaced racks and a support bracket supporting a pair of pinions in engagement with said pair of spaced racks;

a window mounted to said support bracket, said window including a top edge, a front edge, a rear edge and a bottom edge, one of said front and rear edges being angled so as to generally correspond with a first pillar angle, the other of said front and rear edges being angled so as to generally correspond to a second pillar angle, said first pillar angle being greater than zero degrees from vertical and said bottom edge being generally perpendicular to said one of said front and rear edge, and said pair of spaced racks being generally parallel to said first pillar angle.

59. A method of making dual racks for window lift mechanisms to be used with first and second vehicle doors having different window configurations, comprising:

determining a first radius of curvature for a first window of the first vehicle door;

determining a second radius of curvature for a second window of the second vehicle door;

determining a first required length of travel of said first window;

determining a second required length of travel of said second window;

providing a mold cavity defining a pair of parallel racks each having a plurality of gear teeth, a radius of curvature of said pair of parallel racks being between said first and second radii of curvature of the first and

second windows and a length of said racks being sufficient to accommodate a longer of said first and second required lengths of travel of said first and second windows;

injecting molten plastic into said mold cavity; and

removing the molded racks from the mold cavity.

60. The method of claim 59, wherein during molding of the dual racks for the window having a shorter of said first and second required lengths of travel, an insert is provide in said mold cavity to shorten the length of gear teeth on said dual racks.

61. A vehicle door comprising:

an outer door panel;

an inner door panel connected to said outer door panel;

a window lift mechanism disposed between said inner and outer door panels and including a pair of parallel spaced toothed racks and a support bracket supporting a pair of pinions in driving engagement with said pair of spaced racks;

a window mounted to said support bracket, said window including a top edge, a front edge, a rear edge and a bottom edge, one of said front and rear edges being angled so as to generally correspond with a first pillar angle, said first pillar angle being greater than zero degrees from vertical and said bottom edge being generally horizontal, wherein said pair of racks are mounted generally parallel to said first pillar angle and said window is mounted to said support bracket via a pair of mount brackets, one of said mount brackets being longer than the other to accommodate for said first pillar angle.

62. A window lift mechanism, comprising:

a support bracket;

a drive motor supported on said support bracket;

a first pinion rotatably driven by said drive motor, said first pinion engaging a first rack;

a second pinion rotatably driven by said first pinion, said second pinion engaging a second rack, whereby rotation of said motor causes movement of said support bracket relative to said first and second racks,

wherein at least one of said support bracket and said first and second racks is made from a statically dissipative plastic composite material.

63. The window lift mechanism according to claim 62, wherein said first and second pinions are made from a statically dissipative plastic composite material.